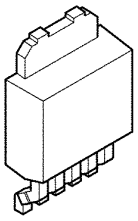
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA48S018F, TA48S02F, TA48S025F, TA48S03F, TA48S033F, TA48S05F

1-A Output Current and Low Dropout Voltage Regulator with ON/OFF Control Switch

The TA48S**F series consists of small-surface mount type low-dropout regulators with an output current of 1 A (maximum) and an ON/OFF control switch. Control by an EN (ON/OFF) terminal enables the regulator to be operated only when required (output ON).
Therefore these newly developed regulators are suitable for use in the power supply circuits of AV, OA and other digital devices equipped with a stand-by function, and of battery-operated portable data devices of various types, where they will contribute to energy saving. Moreover, the regulators have an output voltage line-up starting from 1.8V, and which corresponds to the under-voltage of various devices.



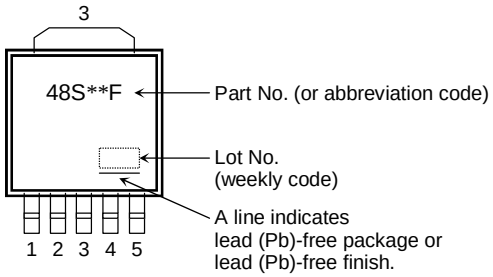
HSIP5-P-1.27A

Weight: 0.29 g (typ.)

Features

- Built-in ON/OFF control function (active high)
- Maximum output current: 1 A
- Low output voltage: 1.8/2.0/2.5/3.0/3.3/5.0 V
- Output voltage accuracy: V_{OUT} ± 3% (@T_j = 25°C)
- Low standby current: 800 μA (typ.) (@I_{OUT} = 0 A)
- Low quiescent current (output OFF mode): 0.5μA (typ.)
- Low-dropout voltage: 0.5 V (max) (@I_{OUT} = 0.5 A)
- Protection function: Over current/over temperature/ASO
- Package type: Surface-mount 5-pin PW-MOLD

Pin Assignment



1: INPUT(IN)
2: ENABLE (EN)
3: GND
4: NC
5: OUTPUT (OUT)

Note: The "**" in each product name is replaced with the output voltage of each product.

Pin Connections

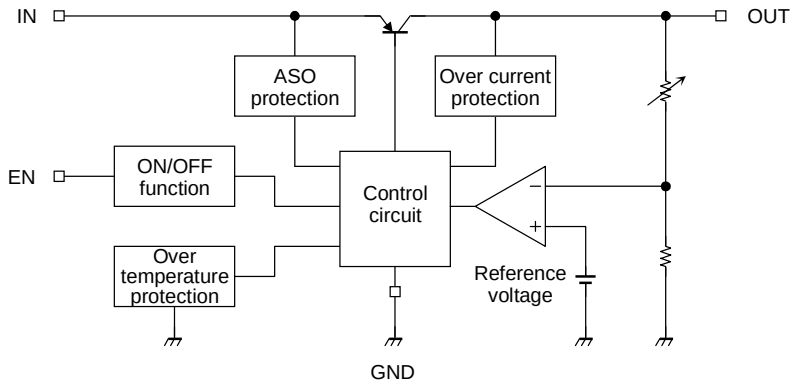
Pin No.	Symbol	Description
1	IN	Input terminal. Connected by capacitor (C_{IN}) to GND.
2	EN	Output ON/OFF control terminal Output is ON when this pin is set to “High”, OFF when this pin is open or set to “Low”
3	GND	Ground terminal
4	NC	Non-connection
5	OUT	Output terminal. Connected by capacitor (C_{OUT}) to GND.

How to Order (Note 1)

Product No.	Package	Package Type and Capacity
TA48S**F (TE16L1)	PW-MOLD 5 Pin: Surface-mount	Tape (2000 pcs/reel)

Note 1: The “**” in each product number is replaced with the output voltage of each product.

Block Diagram



Absolute Maximum Rating (Ta = 25°C) (Note 2)

Characteristic		Symbol	Rating	Unit
Input voltage		V_{IN}	16	V
EN Input voltage		V_{EN}	16	V
Output current		I_{OUT}	1	A
Operating temperature		T_{opr}	−40~85	°C
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	−55~150	°C
Power dissipation	Ta = 25°C	P_D	1	W
	Tc= 25°C		10	
Thermal resistance	junction-ambient	$R_{th(j-a)}$	125	°C/W
	junction-case	$R_{th(j-c)}$	12.5	

Note 2: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Note 3: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Protection Function (Reference) (Note 3)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Over temperature	T_{SD} (T_j)	—	—	160	—	°C
Peak circuit current	I_{PEAK}	$V_{IN} = V_{OUT} + 2$ V, $T_j = 25$°C	—	1.5	—	A
Short circuit current	I_{SC}	$V_{IN} = V_{OUT} + 2$ V, $T_j = 25$°C	—	1.5	—	A

Note 4: Ensure that the devices operate within the limits of the maximum rating when in actual use.

TA48S018F
Electrical Characteristics
(Unless otherwise specified, V_{EN} = 3.8 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 3.8 V, I_{OUT} = 0.5 A	1.746	1.8	1.854	V
		2.8 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	1.72	1.8	1.88	
Line regulation	Reg·line	2.8 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 3.8 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	20	mV
Quiescent current	I_B	2.8 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		2.8 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	0.7	5	mA
		V_{IN} = 2.5 V, I_{OUT} = 1 A	—	10	30	
Output noise voltage	V_{NO}	V_{IN} = 3.8 V, I_{OUT} = 50 mA, 10 Hz ≦ f ≦ 100 kHz	—	75	—	μVrms
Ripple rejection	R.R.	2.8 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 50 mA, f = 120 Hz	53	65	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.5	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 2.8 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 3.8 V, I_{OUT} = 0.1 A	—	20	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 3.8 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S02F
Electrical Characteristics
(Unless otherwise specified, V_{EN} = 4.0 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 4.0 V, I_{OUT} = 0.5 A	1.94	2.0	2.06	V
		3.0 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	1.91	2.0	2.09	
Line regulation	Reg·line	3.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 4.0 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	20	mV
Quiescent current	I_B	3.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		3.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	0.7	5	mA
		V_{IN} = 2.6 V, I_{OUT} = 1 A	—	10	30	
Output noise voltage	V_{NO}	V_{IN} = 4.0 V, I_{OUT} = 50 mA, 10 Hz ≦ f ≦ 100 kHz	—	80	—	μVrms
Ripple rejection	R.R.	3.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 50 mA, f = 120 Hz	52	65	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.25	0.5	V
		I_{OUT} = 1 A	—	0.4	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 3.0 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 4.0 V, I_{OUT} = 0.1 A	—	25	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 4.0 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S025F
Electrical Characteristics
(Unless otherwise specified, V_{EN} = 4.5 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 4.5 V, I_{OUT} = 0.5 A	2.425	2.5	2.575	V
		3.5 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	2.388	2.5	2.612	
Line regulation	Reg·line	3.5 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 4.5 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	20	mV
Quiescent current	I_B	3.5 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		3.5 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	0.9	5	mA
		V_{IN} = 2.7 V, I_{OUT} = 1 A	—	12	30	
Output noise voltage	V_{NO}	V_{IN} = 4.5 V, I_{OUT} = 50 mA, 10 Hz ≦ f ≦ 100 kHz	—	95	—	μVrms
Ripple rejection	R.R.	3.5 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 50 mA, f = 120 Hz	52	64	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 3.5 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 4.5 V, I_{OUT} = 0.1 A	—	30	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 4.5 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S03F
Electrical Characteristics
(Unless otherwise specified, V_{EN} = 5.0 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 5.0 V, I_{OUT} = 0.5 A	2.91	3.0	3.09	V
		4.0 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	2.865	3.0	3.135	
Line regulation	Reg·line	4.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 5.0 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	20	mV
Quiescent current	I_B	4.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		4.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	1.1	5	mA
		V_{IN} = 2.8 V, I_{OUT} = 1 A	—	13	30	
Output noise voltage	V_{NO}	V_{IN} = 5.0 V, I_{OUT} = 50 mA, 10 Hz ≦ f ≦ 100 kHz	—	110	—	μVrms
Ripple rejection	R.R.	4.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 50 mA, f = 120 Hz	50	63	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 4.0 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 5.0 V, I_{OUT} = 0.1 A	—	35	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 5.0 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S033F
Electrical Characteristics
(Unless otherwise specified, V_{EN} = 5.3 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 5.3 V, I_{OUT} = 0.5 A	3.2	3.3	3.4	V
		4.3 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	3.152	3.3	3.448	
Line regulation	Reg·line	4.3 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 5.3 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	20	mV
Quiescent current	I_B	4.3 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		4.3 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	1.1	5	mA
		V_{IN} = 2.9 V, I_{OUT} = 1 A	—	13	30	
Output noise voltage	V_{NO}	V_{IN} = 5.3 V, I_{OUT} = 50 mA, 10 Hz ≦ f ≦ 100 kHz	—	115	—	μVrms
Ripple rejection	R.R.	4.3 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 50 mA, f = 120 Hz	48	61	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 4.3 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 5.3 V, I_{OUT} = 0.1 A	—	35	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 5.3 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S05F
Electrical Characteristics
(Unless otherwise specified, V_{EN} = 7.0 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

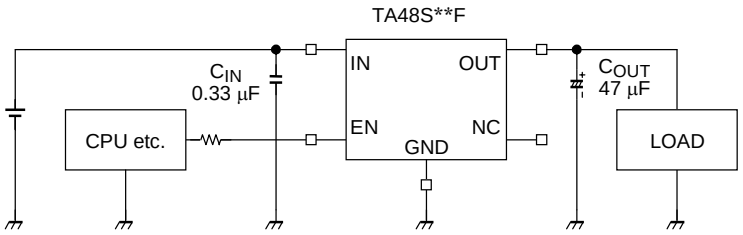
Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 7 V, I_{OUT} = 0.5 A	4.85	5.0	5.15	V
		6.0 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	4.775	5.0	5.225	
Line regulation	Reg·line	6.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 7.0 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	30	mV
Quiescent current	I_B	6.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		6.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	1.3	5	mA
		V_{IN} = 3.0 V, I_{OUT} = 1 A	—	14	30	
Output noise voltage	V_{NO}	V_{IN} = 7.0 V, I_{OUT} = 50 mA, 10 Hz ≦ f ≦ 100 kHz	—	150	—	μVrms
Ripple rejection	R.R.	6.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 50 mA, f = 120 Hz	48	60	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 6.0 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 7.0 V, I_{OUT} = 0.1 A	—	50	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 7.0 V, V_{EN} = 0 V	—	0.1	2	μA

Precaution on Application

T_j = 25°C in the measurement conditions of each item is a regulation for where a pulse test is carried out and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

Depending on the load conditions, a steep increase in the input voltage applied (VIN) may cause a momentary rise in output voltage (VOUT) even if the EN (enable) pin is Low. Treat with care.

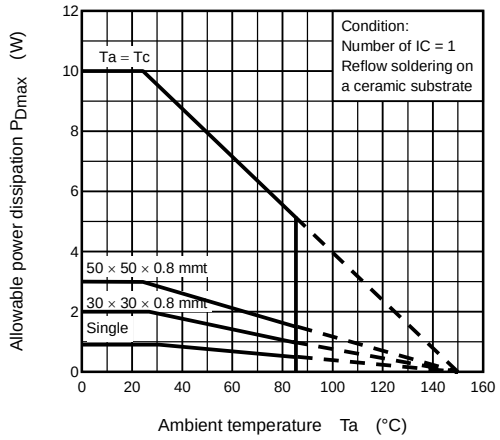
Standard Application Circuit



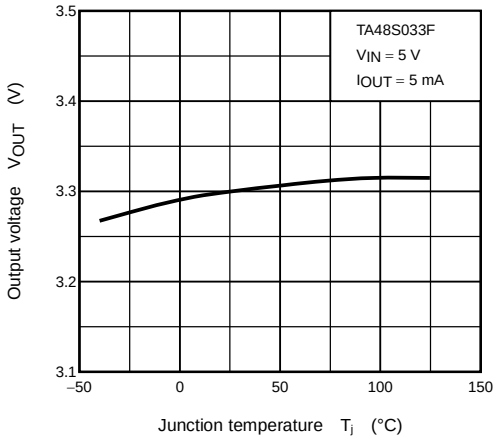
Be sure to connect a capacitor near the input terminal and output terminal between both terminals and GND.

The capacitances should be determined experimentally. In particular, adequate investigation should be made to ensure there are no problems even in high or low temperatures.

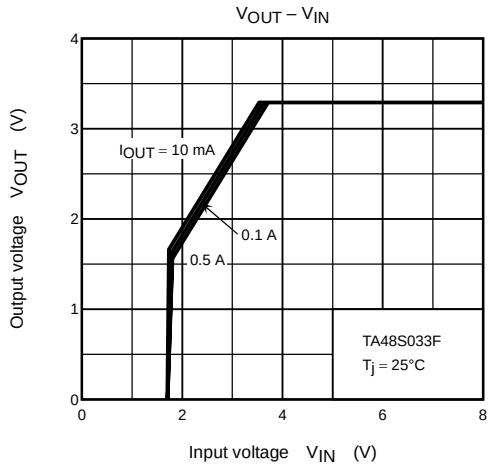
P_{Dmax} – Ta



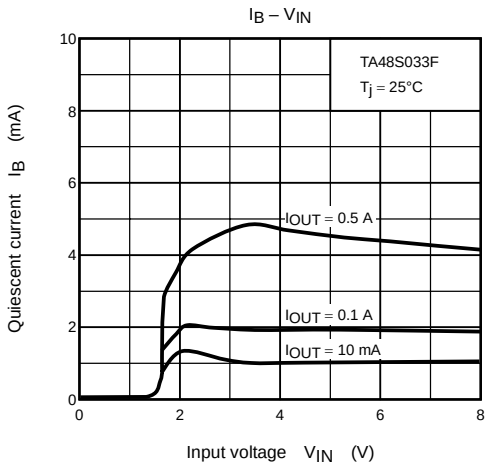
V_{OUT} – T_j



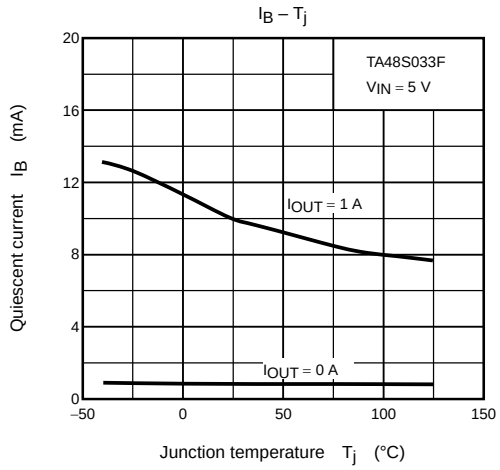
V_{OUT} – V_{IN}



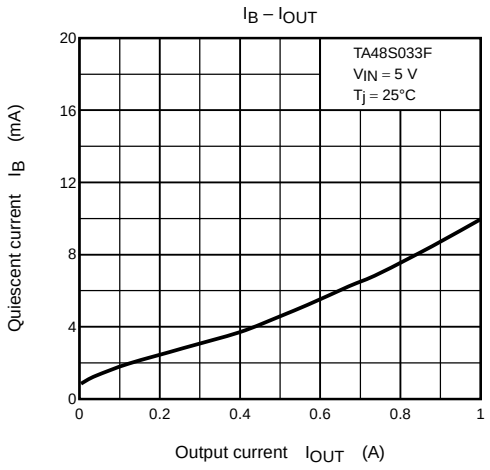
I_B – V_{IN}



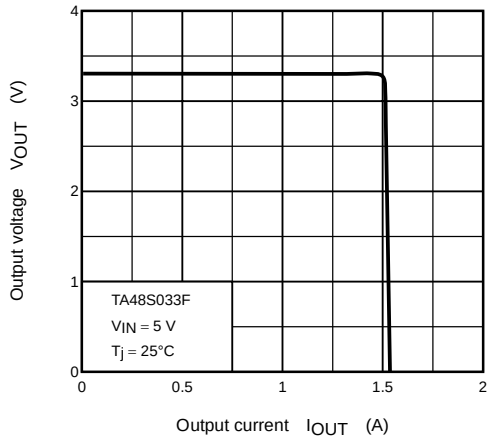
I_B – T_j



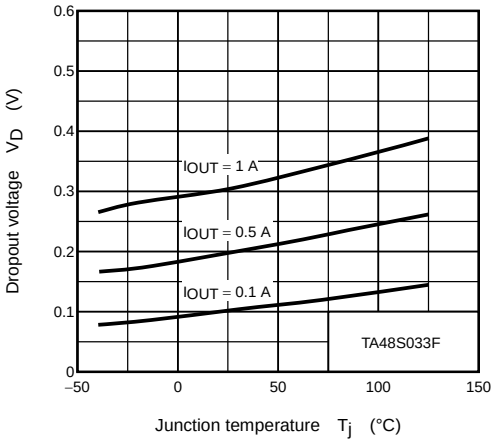
I_B – I_{OUT}



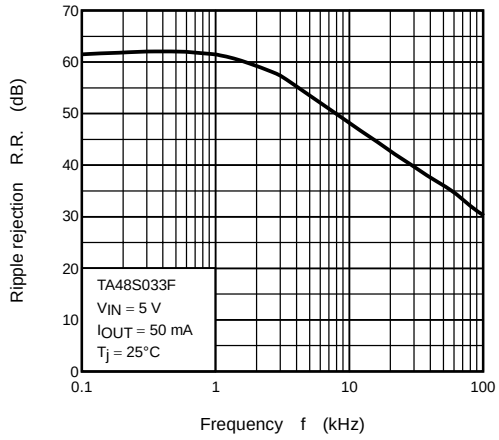
$V_{OUT} - I_{OUT}$



$V_D - T_j$

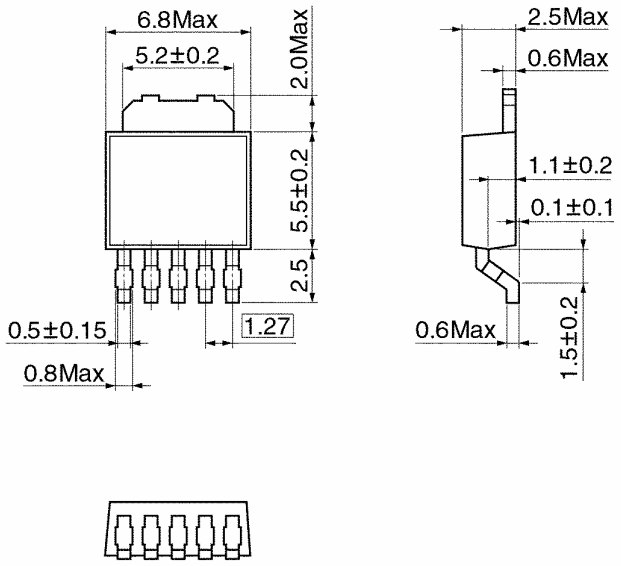


R.R. – f



Package Dimensions

HSIP5-P-1.27A Unit: mm



Weight: 0.29 g (typ.)

RESTRICTIONS ON PRODUCT USE

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- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
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